

REMARKS

Claims 1, 3-4, 7-8, 10-11, 15, 23, 26, 28, 48, 50, 52, 54, 57, and 58 are amended, no claims are canceled, and no claims are added; as a result, claims 1, 3-13, 15-17, 23-30, 48-54, and 57-58 are now pending in this application.

Support for the amendments to claims 1, 3-4, 7-8, 10-11, 15, 23, 26, 28, 48, 50, 52, 54, 57, and 58 may be found throughout the specification, for example, on page 6, line 1 through page 7, line 6. Further support for the amendments to claims 1, 4, 7-8, 10-11, 23, 26, 48, 52, 54, and 57 may be found for example on page 7 at lines 24-26 of the specification. Further support for the amendments to claims 4, 48, and 58 may be found for example on page 5 at lines 9-12 of the specification. Claim 3 was amended to correct an antecedent basis issue due to the amendments to claim 1, from which claim 3 depends. Further support for the amendment to claim 28 may be found on page 6 at lines 27-28 of the specification. Claim 50 was amended merely to add the word "one" in order to correct "one" being missing from the phrase "at least one." No new matter has been added through the amendments to claims 1, 3-4, 7-8, 10-11, 15, 23, 26, 28, 48, 50, 52, 54, 57, and 58.

In the Drawings

Formal drawings of Figures 1-7 on sheets 1-7 are included with this response. Figure 3 has been amended to include the missing reference number 390 and to include the dimension lines and arrows associated with reference number 390. Support for this amendment may be found in the specification on page 7 at lines 24-26. No new matter is included with this submission of formal drawings.

§102 Rejection of the Claims

Claims 1, 3-8, 11, 15-17, 23-30, 48-54, and 57-58 were rejected under 35 U.S.C. § 102(e) for anticipation by Huang et al. (U.S. 6,069,066).

Huang et al. fails to anticipate claims 1, 3-8, 11, 15-17, 23-30, 48-54, and 57-58 because Huang et al. fails to teach each of the elements included in claims 1, 3-8, 11, 15-17, 23-30, 48-54, and 57-58. For example, claim 1 as amended now recites,

a trench including a first barrier layer and a seed layer, the trench having a depth and a width, the depth being greater than a critical depth; and

at least one metal layer above the seed layer; wherein the number of metal layers is determined by the width and wherein the critical depth includes a vertical thickness of the first barrier layer and a vertical thickness of the seed layer and a vertical thickness of a metal layer and a vertical thickness of a second barrier layer. (Emphasis added).

In contrast, Huang et al. at column 2, lines 38-41 recites,

In FIG. 2B, a conformal barrier layer 208 is formed on the inter-metal dielectric layer 202. A first metal layer 210, such as a copper layer, is formed on the barrier layer 208 to fill partially the trenches 204, 205, 206.

However, there is no teaching in Huang et al. of a seed layer as recited in claim 1. Further, there is no teaching in Huang et al. of a critical depth as recited in claim 1, because the Huang et al. reference fails to disclose a seed layer and a second barrier layer, and therefore fails to teach a critical depth including a vertical thickness of the seed layer and a vertical thickness of a second barrier layer. Thus, Huang et al. fails to teach all of the elements included in amended claim 1.

Each one of independent claims 4, 7, 8, 11, 15, 23, 26, 48, 52, 54, 57, and 58 also includes a seed layer, which, as stated above, is not taught by Huang et al. Further, other elements are included in independent claims 4, 7, 8, 11, 15, 23, 26, 48, 52, 54, 57 and 58 that are not taught by the Huang et al. reference. For example, and not by way of limitation, claims 4, 7, 8, 11, 26, and 48 all recite, "wherein the critical depth includes a vertical thickness of the first barrier layer and a vertical thickness of the seed layer and a vertical thickness of a metal layer and a vertical thickness of a second barrier layer," and claims 52 and 57 recite, "wherein the critical depth includes a vertical thickness of the first barrier layer and a vertical thickness of the seed layer and a vertical thickness of the metal layer and a vertical thickness of a second barrier layer." For at least the reasons stated above with respect to claim 1, these elements recited in claims 4, 7, 8, 11, 26, 48, 52, and 57 are not taught by Huang et al.

Because Huang et al. fails to teach all of the elements recited in claims 1, 4, 7, 8, 11, 15, 23, 26, 48, 52, 54, 57, and 58, these claims are not anticipated by Huang et al. Further,

dependent claims 3, 5-6, 16-17, 24-25, 27-30, 49-51, and 53 depend from one of independent claims 1, 4, 11, 15, 23, 26, 48, and 52, and include all the elements recited in the independent claim from which they depend. For at least the reasons stated above with respect to independent claims 1, 4, 11, 15, 23, 26, 48, and 52, Huang et al. fails to teach all of the elements included in dependent claims 3, 5-6, 16-17, 24-25, 27-30, 49-51, and 53, and so dependent claims 3, 5-6, 16-17, 24-25, 27-30, 49-51, and 53 are not anticipated by Huang et al.

For at least the reasons stated above, Applicant respectfully requests withdrawal of the 35 U.S.C. § 102(e) rejection, and reconsideration and allowance of claims 1, 3-8, 11, 15-17, 23-30, 48-54, and 57-58.

§103 Rejection of the Claims

§ 103 Rejection of claims 14, 55, 56, and 60.

Claims 14, 55, 56, 59, and 60 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang et al. (U.S. 6,069,066) in view of Lin et al. (U.S. 6,551,916).

Applicant respectfully submits that claims 14, 55, 56, 59, and 60 are canceled, and therefore the rejection of these claims is moot.

§ 103 Rejection of claims 9, 10, 12, and 13.

Claims 9, 10, 12, and 13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang et al. in combination with Ooishi (U.S. 6,208,547).

The proposed combination of Huang et al. and Ooishi fails to teach or suggest all of the elements included in claims 9-10 and 12-13.

The proposed combination of Huang et al. and Ooishi fails to teach or suggest each of the elements included in claims 9-10 and 12-13, and therefore claims 9-10 and 12-13 are not obvious in view of this proposed combination of references.

For example, claim 10 as amended now recites, "a trench including a first barrier layer and a seed layer," and further, claim 10 as amended recites, "wherein the critical depth includes a vertical thickness of the first barrier layer and a vertical thickness of the seed layer and a vertical

thickness of a metal layer and a vertical thickness of a second barrier layer." For reasons analogous to those stated above with respect to claims 1, 3-8, 11, 15-17, 23-30, 48-54, and 57-58, Huang et al. fails to teach or suggest all of the elements included in claim 10. Further, Applicant's representatives fail to find in Ooishi the elements included in claim 10 and missing from Huang et al. Thus, the proposed combination of Huang et al. and Ooishi fails to teach or suggest each of the elements included in claim 10.

Claim 9 depends from claim 8, and claims 12-13 depend from claim 11. Therefore, claims 9 and 12-13 include all of the elements recited in claims 8 and 11 respectively. For at least the reasons stated above with respect to claims 1, 3-8, 11, 15-17, 23-30, 48-54, and 57-58, Huang et al. fails to teach or suggest all of the elements included in claims 8 and 11, and thus fails to teach or suggest all of the elements included in claims 9 and 12-13. Applicant's representatives fail to find in Ooishi the elements included in claims 9 and 12-13 and missing from Huang et al. Thus, the proposed combination of Huang et al. and Ooishi fails to teach or suggest each of the elements included in claims 9 and 12-13.

The Office Action fails to provide a proper basis for forming the proposed combination of the Huang et al. and the Ooishi references in rejecting claims 9-10 and 12-13.

In the previously submitted response to a prior Office Action, the prior Office Action mailed March 23, 2005, Applicant made the following statements regarding the proposed combination of Huang et al. and Ooishi:

The Office Action, in an attempt to meet the requirements of *In re Sang Su Lee*, on page 6 states, "It would have been obvious to one of ordinary skill in the art to incorporate the contact structure of Huang with the logic/memory interconnect structure of Ooishi [sic] in order to provide a contact structure as required by Ooishi (36006 and n1200) and that is free form oxide as taught by Huang (Col. 1, Lines 66-67)." However, these statements are not supported by the record. Ooishi at column 11, lines 8-13 recites,

FIG. 13 illustrates the sectional structure of the memory core 1000 shown in FIG. 12 connected with the logic core 3000 on a flip chip.

A pad 3006 of the logic core 3000 and the pad 1202 of the memory core 1000 are connected with each other through the solder bump 1201.

Thus, Ooishi is concerned with connections between pads using solder bumps, and thus teaches away from the contact structure of Huang *et al.* Further, the Office Action fails to point to any indication that Ooishi is concerned with "oxide" as suggested in the Office Action. Thus, the arguments made for the proposed combination of Huang *et al.* with Ooishi are not found in the cited documents. Thus, the Office Action fails to meet the standard established by *In re Sang Su Lee* for provide specific, objective evidence of record for a finding of a teaching, suggestion, or motivation to combine the reference teachings. Therefore, the Office Action fails to state a *prima facie* case of obviousness with respect to claims 9, 10, 12, and 13.

In response to these arguments, the present Office Action on page 7 states,

Likewise applicant contends that Ooshi teaches away from the contact structure of Huang. This amounts to an argument based on the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teaching of the references would have suggested to those of ordinary skill in the art.

While not necessarily agreeing with these statements, Applicant submits the following:

The Examiner must provide a specific reason to support an obvious rejection. *Ex parte Humphreys*, 24 USPQ2d 1255 (B.P.A.I. 1992). The fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990); MPEP § 2143.01. (Emphasis added).

And further,

A factor cutting against a finding of motivation to combine or modify the prior art is when the prior art teaches away from the claimed combination. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path the applicant took. *In re Gurley*, 27 F.3d 551, 31 USPQ 2d 1130, 1131 (Fed. Cir. 1994); *United States v. Adams*, 383 U.S. 39, 52, 148 USPQ 479, 484 (1966); *In re Sponnoble*, 405 F.2d 578, 587, 160 USPQ

237, 244 (C.C.P.A. 1969); *In re Caldwell*, 319 F.2d 254, 256, 138 USPQ 243, 245 (C.C.P.A. 1963). (Emphasis added).

Thus, in making an obviousness rejection based on a combination of references, the Office Action must conform to the requirements as stated above. However, in the previous Office Action and in the present Office Action, the specific reasons for forming the combination of Huang et al. and Ooishi given in the Office Action are not supported by the references, as argued in Applicant's previous response as quoted above. The additional statements on pages 7-8 of the present Office Action fail to remedy this deficiency. In addition, as also argued in Applicant's previous response as quoted above, the disclosure in Ooishi teaches away from the contact structure of Huang et al., and thus is a factor cutting against a finding of a motivation to combine Ooishi with Huang et al.

Therefore, Applicant maintains the arguments that the Office Action has failed to provide a proper basis for forming the proposed combination of the Huang et al. and Ooishi references, and therefore, fails to state a *prima facie* case of obviousness with respect to claims 9-10, and 12-13.

For at least the reasons stated above, Applicant respectfully requests withdrawal of the 35 U.S.C. § 103(a) rejection of claims 9-10 and 12-13, and reconsideration and allowance of claims 9-10 and 12-13.

Reservation of Rights

Applicant does not admit that references cited under 35 U.S.C. §§ 102(a), 102(e), 103/102(a), or 103/102(e) are prior art, and reserves the right to swear behind them at a later date. Arguments presented to distinguish such references should not be construed as admissions that the references are prior art.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 349-9587 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop AF, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 7 day of December, 2005.

KATE GANNON

Name

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Signature

IN THE DRAWINGS

Corrected drawings are supplied herewith. Sheets 1-7 include a title block and are identified as “REPLACEMENT SHEET”. Figure 3 has been amended to include missing reference number 390 and the missing dimension lines and arrows associated with reference number 390.